6.7 Areas of Triangles and Quadrilaterals

Goals
- Find the areas of squares, rectangles, parallelograms, and triangles.
- Find the areas of trapezoids, kites, and rhombuses.

POSTULATE 22: AREA OF A SQUARE POSTULATE

The area of a square is the square of the length of its side, or $A = \_\_\_\_$.

POSTULATE 23: AREA CONGRUENCE POSTULATE

If two polygons are ____________, then they have the same area.

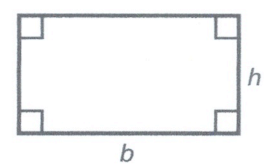
POSTULATE 24: AREA ADDITION POSTULATE

The area of a region is the ______ of the areas of its nonoverlapping parts.

THEOREM 6.20: AREA OF A RECTANGLE

The area of a rectangle is the product of its base and height.

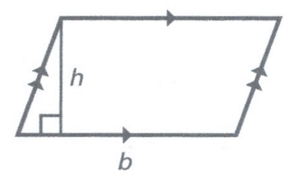
$A = \_\_\_\_$



THEOREM 6.21: AREA OF A PARALLELOGRAM

The area of a parallelogram is the product of a base and its corresponding height.

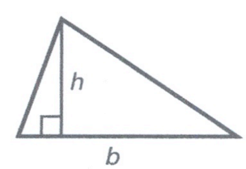
$A = \_\_\_\_$



THEOREM 6.22: AREA OF A TRIANGLE

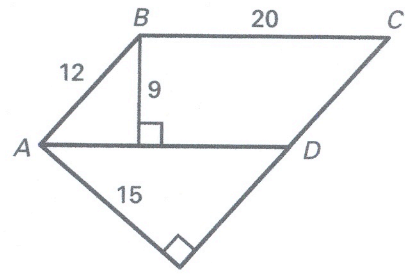
The area of a triangle is one half the product of a base and its corresponding height.

$A = \_\_\_\_\_\_$



Example 1 *Using the Area Theorems*

Find the area of ▱*ABCD*.



Solution

Use $\overline{AB}$ as the base. So, $b =$ ____ and $h =$ ____.

Area $= bh$

$=$ ____(____)

$=$ _____ square units

Notice that you get the same area using $\overline{BC}$ as the base.

Example 2 *Finding the Height of a Triangle*

Rewrite the formula for the area of a triangle in terms of h. Then use your formula to find the height of a triangle that has an area of 18 and a base length of 6.

Solution

Rewrite the area formula so h is alone on one side of the equation.

$A =$ ______	**Formula for the area of a triangle**
_____ $=$ _____	**Multiply each side by 2.**
_____ $= h$	**Divide each side by *b*.**

Substitute ___ for A and ___ for b to find the height of the triangle.

$h =$ _____ $=$ ______ $=$ ___

Answer The height of the triangle is ___.

Checkpoint Find the area or height of the polygon.

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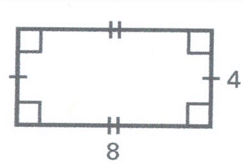
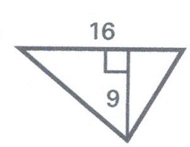
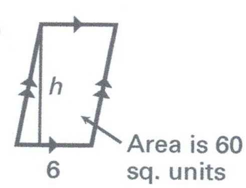
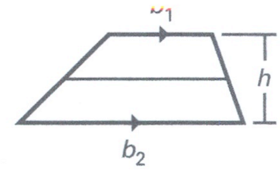
		

of the height and the sum of the bases.

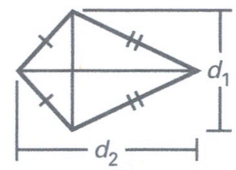
$A =$ ______



THEOREM 6.24: AREA OF A KITE

The area of a kite is one half the product of the lengths of its diagonals.

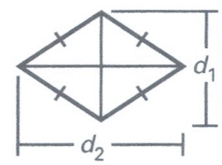
$A =$ ______



THEOREM 6.25: AREA OF A RHOMBUS

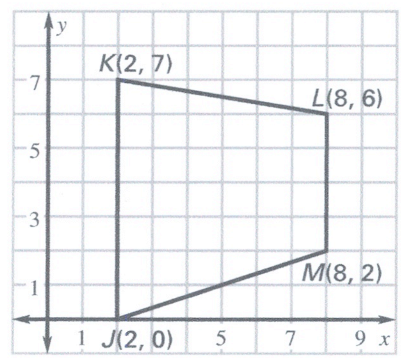
The area of a rhombus is one half the product of the lengths of the diagonals.

$A =$ ______



Example 3 ***Finding the Area of a Trapezoid***

Find the area of trapezoid *JKLM*.



Solution

The height of *JKLM* is
$h =$ ___ $-$ ___ $=$ ___.

Find the lengths of the bases.

$b_1 = JK =$ ___ $-$ ___ $=$ ___

$b_2 = LM =$ ___ $-$ ___ $=$ ___

Substitute ___ for h, ___ for b_1, and ___ for b_2 to find the area of the trapezoid.

$A = \frac{1}{2}h(b_1 + b_2)$ **Formula for area of a trapezoid**

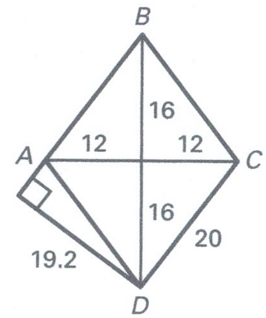
$= \frac{1}{2}$(___)(___ $+$ ___) **Substitute.**

$=$ ______ **Simplify.**

Answer The area of trapezoid *JKLM* is ___ square units.

Example 4 *Finding the Area of a Rhombus*

Use the information in the diagram to find the area of rhombus $ABCD$.



Solution

Method 1 Use the formula for the area of a rhombus. Let $d_1 = BD =$ ____ and $d_2 = AC =$ ____.

$A = \frac{\_\_}{\_\_} d_1 d_2$

$= \frac{\_\_}{\_\_}(\_\_)(\_\_)$

$=$ ____ square units

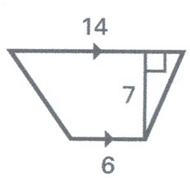
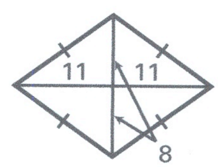
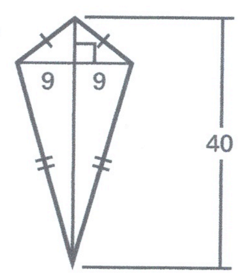
Method 2 Use the formula for the area of a parallelogram. Let $b =$ ____ and $h =$ ____.

$A = bh$

$= (\_\_)(\_\_)$

$=$ ____ square units

Checkpoint **Find the area of the polygon.**

4. 	**5.** 	**6.** 

Practice A

For use with pages 372–380

Find the area of the polygon.

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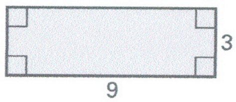

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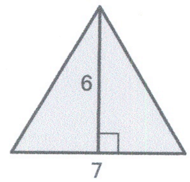

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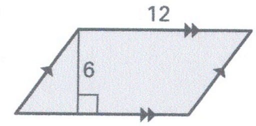

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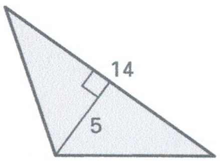

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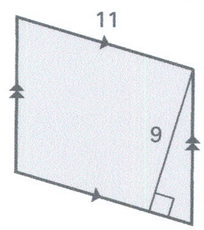

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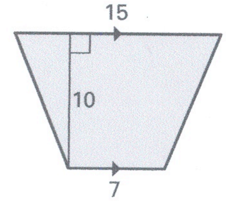

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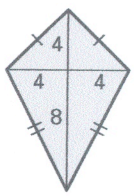

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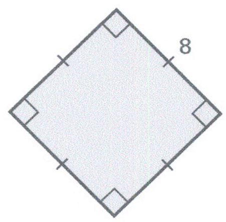

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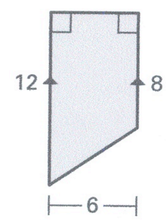
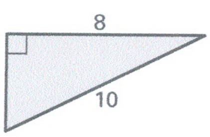


Use the Pythagorean Theorem to find the area of the polygon.

10.



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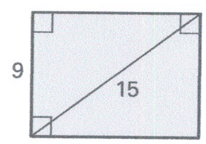

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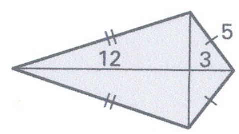
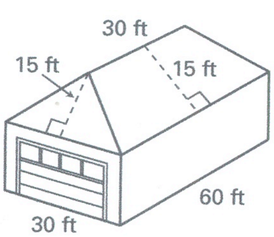
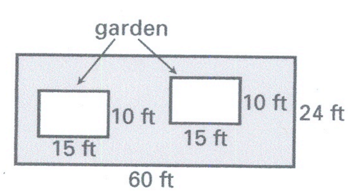


13. The garage roof shown is made from two isosceles trapezoids and two isosceles triangles. Find the area of the entire roof.



14. The Millers have two gardens as shown below. The shaded region represents the lawn that needs to be fertilized. Find the area of the lawn.



LESSON 6.7

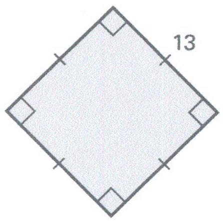
NAME ______________________________ DATE __________

Practice B

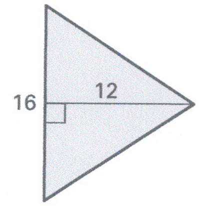
For use with pages 372–380

Find the area of the polygon.

1.



2.



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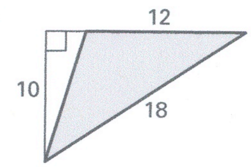

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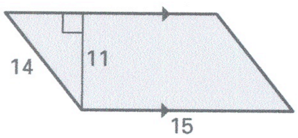

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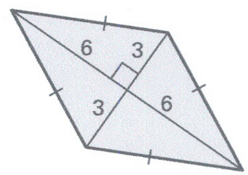

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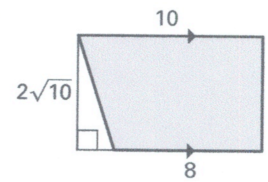

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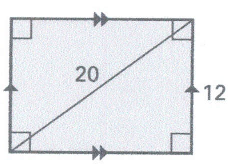

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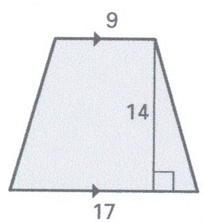

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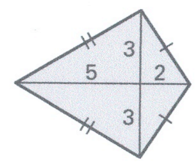
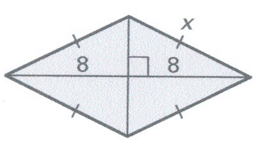


The quadrilateral has an area of 64 square units. Find the value of *x*.

10.



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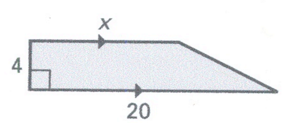

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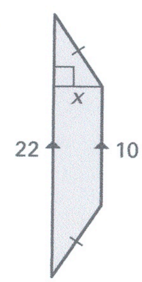

Find the areas of the shaded and unshaded regions.

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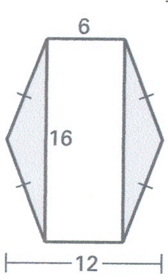

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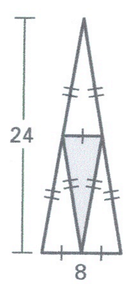

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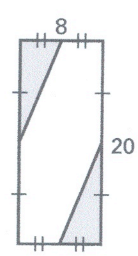

Lesson 6.7